AUTONOMIC DISCRIMINATION WITHOUT AWARENESS: AN INTERIM REPORT

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This paper is an interim report of an experiment which confirms the notion that subjects give discriminatory galvanic skin responses to visual stimuli presented at tachistoscopic speeds too brief for correct verbal report The implied perceptual process is termed by the authors *subception* (verb form—to *subceive*).

Research and theorizing in the area of perceptual dynamics has, to a great extent, concerned itself with observations of differential recognition of various stimuli as a function of the organism's needs One common experimental approach has been to present to subjects words or pictures of varying motivational value at exposure speeds ranging from impossible to easy in recognizability Measurements are made of the exposures at which recognition occurs Differences in recognition thresholds are then correlated with the differences in the motivational import of the stimuli It has been reported frequently in such research that stimuli of different need significance may have different recognition thresholds (**1**, **4**, **6**).

Attempts to interpret this sort of phenomena have led workers into the difficult position of having to postulate some process of discrimination occurring prior to the ability to report correct recognition Such a concept as perceptual selectivity falls into this category (**1**, **6**) Simply stated, if the observation that a subject is capable of recognizing the word *sacred* at a faster exposure than the word *income* is attributed to the differential need value of the words, it seems necessary to postulate that the subject is somehow identifying the significance of the two words prior to his reported recognition of them. The major purpose of the present research is to determine whether such a mechanism might operate in visual situations comparable to those employed in other "need in perception" research. Previous experiments dealing with "sub-liminal" perception (to be reviewed in the complete report of this research at a later date) have not employed experimental techniques sufficiently comparable For example, previous researches have often depended upon ambiguous instructions to the subject, or did not have an independent measure of perceptual behavior, and often used the subject's subjective certainty or lack of certainty to evaluate the "sub-liminal nature" of the stimulus

In addition, the experiments reporting on this subject have rarely concerned themselves with the possibility that apparent differences in perceptual accuracy reflected nothing more than differences in response preferences For example, the subject who reports recognition of the word *sacred* at faster exposures than the word *income* might not be manifesting a real perceptual difference When forced to give prerecognition guesses, this subject might merely be more familiar with the word *sacred,* and, therefore, be more apt to respond with it sooner, or with less available cues, than with the word *income* This research is concerned also with measuring differences in perceptual accuracy as a function of need, while controlling for response preferences As you will note later in this report, the tachistoscopic procedures we used offer considerable change over earlier work of this sort

PROCEDURE

GSR's of the subjects were recorded by means of an A C bridge apparatus[1] Dry silver recording electrodes, ¼" square, were attached to the right forefinger and right middle-finger tip of the subject GSR's were read directly as peak deflections on a Ballantine Electronic Voltmeter These readings were converted to actual impedance changes by substituting a variable resistance box in the circuit in place of the subject, and matching the voltmeter readings, obtained when the subject was in the circuit, with the phase angle of the bridge set at zero It was possible to read pure impedance change because the A C bridge was designed so that the subject's apparent capacitance change could be balanced-out during the experiment, by operating a dial that kept a Lissajous figure closed when the phase angle of the subject and the bridge were exactly equated

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[1] The authors are indebted to Thomas E Arnold, at present in the Department of Medicine, Johns Hopkins Hospital, for the design and development of the GSR apparatus used in this research.

This impedance change (ohms) was transformed mathematically into admittance change (mhos) in keeping with physiological (2) and statistical (3) suggestions as to the most meaningful unit of measure for the GSR

Stimulus words were presented on a beaded screen seven feet from the subject by means of a projection tachistoscope This arrangement allowed for a variation of exposure speeds from 1/150 sec to 1 sec The illumination and range of exposure speeds varied from subject to subject depending on his perceptual performance, and, once established, were held constant for each subject Five different exposure speeds were selected for each subject such that the slowest speed resulted in near 100 per cent accuracy of recognition of all syllables In all cases, the fastest exposure speed resulted in accuracy of recognition which did not differ significantly from chance

Five-letter nonsense syllables were used as the stimuli, to minimize as far as possible differences in familiarity Ten syllables were used, and they were as follows YILIM, ZIFIL, GAHIW, GEXAX, JEJIC, JIVID, YUVUF, ZEWUH, VAVUK, VECYD

The procedure for each subject can be divided into three periods

Equation period After practice at recognition each subject was presented the ten nonsense syllables tachistoscopically and randomized for both order and exposure speeds Even at the speeds where accurate recognition was impossible, each subject was required to make a choice verbally from the 10 syllables that he knew made up the stimulus material being presented to him To aid in this choice, each subject was given, in succession, 10 different lists of the 10 syllables Each list was in a different order to preclude list-order preference on the part of the subject After these 100 presentations, the 10 syllables were divided into two groups of 5 each, being equated for both the number of times the 5 syllables were used in the entire 100 responses, and the number of times the 5 syllables were correctly recognized In all cases it was possible to make this two group division with a high degree of equality Also, in this phase of the experiment, the exposure speed at which near 100 per cent accuracy of recognition occurred was noted for use in the third period of the experiment

Conditioning period In this part of the experiment we employed a one-second exposure speed for all syllable presentations. The GSR was conditioned to the five experimental syllables, using electric shock as the unconditioned stimulus Partial reinforcement was employed, with one third of all presentations of the five experimental syllables being shocked in random order During this conditioning period, each of the 10 syllables was presented an equal number of times to prevent unequal familiarity with the syllables This procedure was continued until consistent conditioned responses to the five experimental syllables were established Subjects were instructed not to report during the conditioning trials but merely to identify to themselves the syllable presented to them They were instructed at the beginning of the conditioning trials that when they were shocked it would be 2/3 seconds following some presentations of the experimental syllables They were further instructed that they would never be shocked after presentations of the five control syllables

Final test period The random syllable presentation procedure used in the Equation Period was repeated here The exposure speeds were set so that the subject had near 100 per cent recognition at the slowest of the five exposure speeds used This time, however, GSR's were recorded during the time between the tachistoscopic flash and the subject's verbal report To minimize the effect of the subject's verbal report on the GSR, the subject was instructed to delay his report until signaled This signal was not given until the GSR was recorded for each syllable presentation

During this part of the experiment no shock was paired with any of the syllables However, because of instruction and prior experience with partial reinforcement, the subject's expectancy of being shocked, and consequently the conditioned response, was maintained throughout the 100 syllable presentations of the final test period

The following data were recorded during the Final Test Period:

1 The syllable flashed
2 The exposure speed of the syllable
3. The subject's verbal choice from the 10 possible syllables.
4 The subject's GSR for each stimulus presentation.

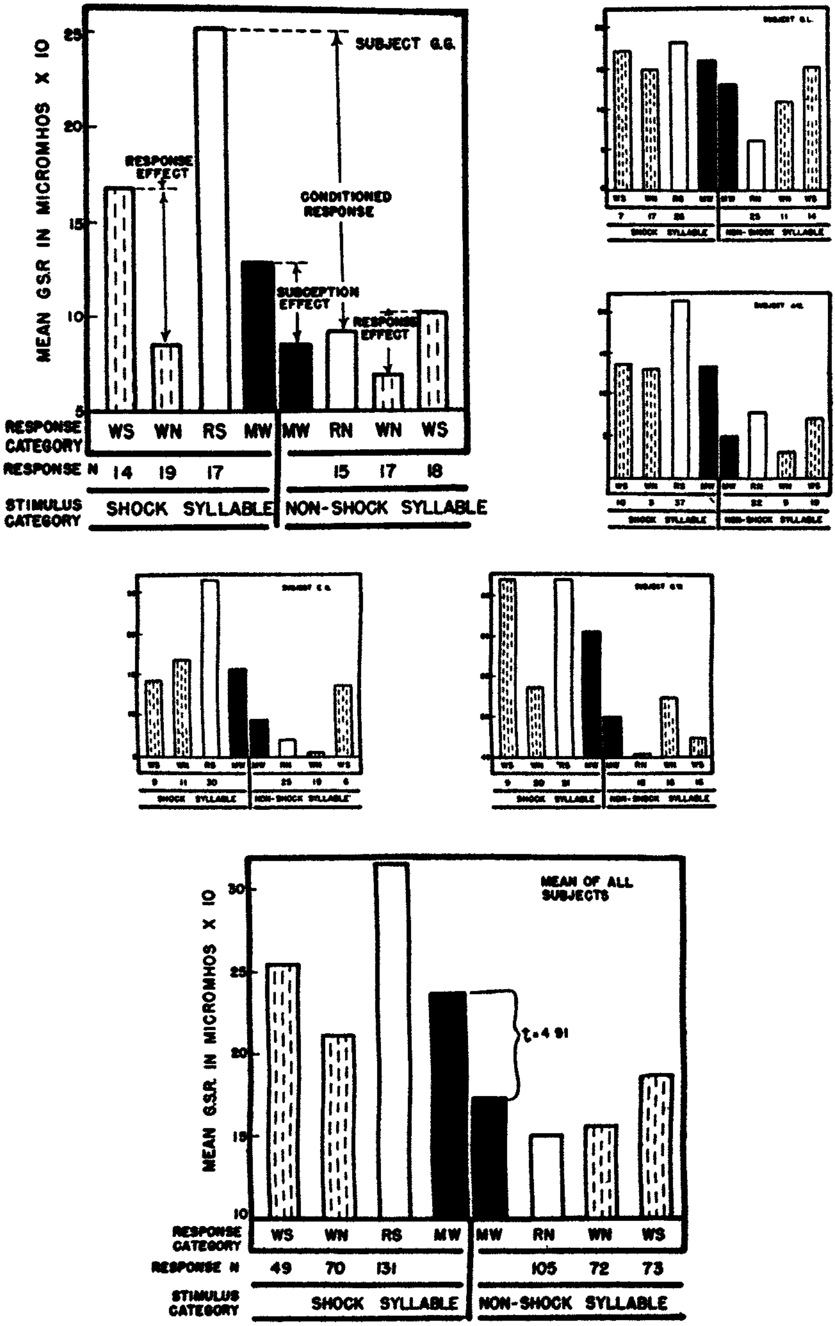
RESULTS

Not all the possible analyses of the data at hand are being presented in this interim report, but will be published later when a larger N has been accumulated. There is one striking finding, illustrated in the bar graphs, which is the main result reported here

These bar graphs show the GSR data obtained in the final test period The GSR's are put in columns in these graphs according to the category of syllable presented (syllables associated with shock and syllables not associated with shock), and the nature of the subject's verbal report the symbol 'W' means that the report was wrong, 'R,' that it was right, 'S,' that the subject reported one of the 5 syllables previously associated with shock, 'N,' that the subject reported one of the 5 syllables never associated with shock 'Response N' refers to the number of separate GSR's contributing to the mean GSR for each category *The two 'MW' (mean wrong) categories are the important GSR measures to note* These represent the average GSR of the 'WS' and 'WN' categories for each of the two stimulus groups Therefore, these 'MW' columns represent the average GSR (equated for both S and N responses) when the subject was not able to perceive correctly (i e , report) the presented syllable

You will notice that in every subject the MW column is larger when the stimulus presented was a 'shock syllable'—and you will recall that in this 'MW' category the subject was not able to perceive the syllable correctly This consistent 'MW' difference is summarized as the combined data for all subjects in the last bar graph Student's t for this difference is 4 91, which is significant below the 1 per cent level of confidence for 4 degrees of freedom Further subjects are in the process of being run, but there does not seem to be any great doubt that this is a true difference

In an experimental procedure necessarily as involved as this one, it might well be suspected that the 'MW' difference reported above could be the result of some artifact This possibility is considered briefly in the conclusions, but at this point it is encouraging to note that the further analysis of this 'MW' difference (cf Table I) for different exposure speeds, classified in terms of the subject's accuracy of recognition at the various speeds, demonstrates the difference to


MEAN G.S.R. IN MICROMHOS X 10
SUBJECT G.G.
5
10
15
20
25
RESPONSE EFFECT
CONDITIONED RESPONSE
SUBCEPTION EFFECT
RESPONSE EFFECT
RESPONSE CATEGORY
WS WN RS MW MW RN WN WS
RESPONSE N
14 19 17 15 17 18
STIMULUS CATEGORY
SHOCK SYLLABLE
NON-SHOCK SYLLABLE
SUBJECT G.L.
WS WN RS MW MW RN WN WS
7 17 26 23 11 14
SHOCK SYLLABLE
NON-SHOCK SYLLABLE
SUBJECT A.G.
WS WN RS MW MW RN WN WS
10 3 37 22 9 10
SHOCK SYLLABLE
NON-SHOCK SYLLABLE
SUBJECT E.G.
WS WN RS MW MW RN WN WS
9 11 30 25 19 6
SHOCK SYLLABLE
NON-SHOCK SYLLABLE
SUBJECT G.R.
WS WN RS MW MW RN WN WS
9 20 21 18 16 16
SHOCK SYLLABLE
NON-SHOCK SYLLABLE
MEAN OF ALL SUBJECTS
MEAN G.S.R. IN MICROMHOS X 10
10
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t = 4 91
RESPONSE CATEGORY
WS WN RS MW MW RN WN WS
RESPONSE N
49 70 131 105 72 73
STIMULUS CATEGORY
SHOCK SYLLABLE
NON-SHOCK SYLLABLE

be present and in the same direction at all levels of accuracy taken individually Further, it will be noted that the 'MW' difference as a function of the subject's accuracy reveals a monotonic function As the subject's accuracy increases, the 'MW' difference tends to become larger It may be that the drop in the 'MW' difference in the '60 per cent to 79 per cent interval' represents a true drop as recognition approaches 100 per cent On the other hand, the drop may mirror the instability of this point where there are necessarily fewer W responses on which to base the 'MW' evaluation

TABLE I

ANALYSIS FOR 'MW' DIFFERENCE FOR DIFFERENT EXPOSURE SPEEDS WITH SPEEDS CLASSIFIED ACCORDING TO THE SUBJECTS' ACCURACY OF RECOGNITION

Percent Accuracy of Recognition	0%—19%	20%—39%	40%—59%	60%—79%
(a) 'MW' for presentation of 'shock' syllables	18 0	26 0	23 9	65 5
(b) 'MW' for presentation of 'nonshock' syllables	15 6	20 3	7 3	52 4
(a) minus (b) ('MW' difference)	2 4	5 7	16 6	13 1

There is one other interesting aspect of our results which will be commented on briefly, although the actual data will not be presented until our complete report When the accuracy of recognition for the shock and nonshock groups of syllables at each of the five speeds was equated for the frequency with which the syllables were used (perceptual accuracy corrected for response probability), the syllables associated with shock in the conditioning period turned out to be correctly recognized more frequently than the nonshock syllables This was true in four of the five subjects Moreover, as you can see in the bar graph summarizing the data for all subjects, the 'N' syllables were used more frequently as responses when the verbal report was wrong (NW) Despite this there are more correct 'S' responses (RS) than correct 'N' responses (RN) Since the two groups of syllables were equated for accuracy and response frequency during the preliminary Equation Period, and presented to the subject an equal number of times during the Conditioning Period, this difference in accuracy is presumably due to the pairing of the five experimental syllables with shock With the present number of subjects, this trend is not statistically significant, and evaluation of it must await the completion of the present research

CONCLUSIONS

There is one clear conclusion that we should like to present It is that even when a subject is unable to report a visual discrimination verbally (i e , he reports incorrectly when forced to make a choice), he is still able to make a stimulus discrimination at some level below that required for conscious recognition This is indicated by the consistent discriminatory Galvanic Skin Responses in the absence of correct verbal report We suggest that this level of perceptual activity be called *subception* Our research is not the first to suggest evidence for this kind of a perceptual process As a process it is implicit in certain clinical concepts It is clearly a postulate in much of the theorizing in the "need in perception" field. There would seem to be practical value in having a term to cover this aspect of perceptual activity

Alternative explanations of our data have been suggested to us, but the nature of the experimental findings refute them

1 Was the subject able to detect minimal cues that 'tipped him off' that a shock-syllable was being presented even though the cues were not sufficient to permit precise report of the syllable in question? It is clear that this kind of explanation does not apply If this were the case, the subjects would have been able to call correctly the shock *vs* nonshock nature of the syllable There is no trend in the data to suggest this In fact, as you can see in the bar graphs, 'N' responses were more commonly given to 'S' stimuli, and 'S' responses more frequently reported when an 'N' stimulus was flashed.

2 Are the GSR's actually responses to the subject's own report of what he thought the syllable was? As is clear from the account of our procedure, all possible controls for this difficulty were employed Despite these controls, it is clear from the bar graphs that to some degree this 'response effect' was present, although it was variable in extent and direction Our use of the 'MW' category,

however, equates for differential 'response effect' so that it does not influence the 'MW' difference that is evidence of *subception*

3 Did the degree of uncertainty of the subjects at subthreshold exposure speeds lead to increased autonomic activity? This would be expected to affect both shock and nonshock stimulus categories alike Moreover, comparison of the GSR's for wrong and right responses to syllables never associated with shock indicates no such 'uncertainty effect'

Despite the highly significant t value substantiating the *subception* effect, the small N employed so far in this study indicates some degree of caution until our procedure can be checked out on a larger group of subjects If appearances to date are not deceiving, however, our data show that some form of prerecognition discrimination is possible and actually occurs in certain visual perceptual situations.

Summary

1 GSR evidence is presented to indicate that at tachistoscopic exposure speeds too rapid for conscious discrimination (as measured by the subject's inability to report what stimulus was presented), the subject is still capable of responding in a discriminatory way

2. It is suggested that the level of perceptual activity indicated by this finding be called *subception*.

References

1 Bruner, J., and Postman, L. Emotional selectivity in perception and reaction. *J Personal.*, 1947, **16**, 69-77

2 Darrow, C W. The significance of the galvanic skin reflex in the light of its relation to quantitative measurements of perspiration *Psychol Bull*, 1934, **31**, 697-698

3 Lacey, O L, *et al* An analysis of the unit of measurement of the galvanic skin response. *J exp Psychol*, 1949, **39**, 122-127

4 McGinnies, E. Emotionality and perceptual defense *Psychol Rev* (in press).

5 Miller, J G Discrimination with awareness *Amer J Psychol*, 1939, **52**, 562-578

6 Postman, L., Bruner, J S, and McGinnies, E Personal values as selective factors in perception. *J abnorm soc Psychol.*, 1948, **43**, 142-154

TOWARDS A REFORMULATION OF THE PERCEPTION-MOTIVATION DICHOTOMY[1]

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THE SEPARATIST APPROACH

A considerable number of studies have appeared during the last decade dealing with the so-called relationship between motivation and perception. Most of these have been successful in demonstrating the "effects of needs upon perception", therefore the empirical phenomena as such seem reasonably established. The theoretical bases of such investigations, however, are seldom stated in more than a vague and equivocal form, and, explicitly or implicitly, devolve upon the view that motivational forces are distinct, separate, and altogether different from those that determine the nature of the perceptual field. "Value and Need as Organizing Factors in Perception" (2), "The Relation of the Intensity of a Need to the Amount of Perceptual Distortion" (6)—even the titles indicate a "separatist" theory of motivation.

Of course, it has been recognized that the cleavage between the cognitive and conative phenomena is far from sharp, and an attempted resolution has been made by the introduction of a concept of "interaction" between motivational and cognitive processes. Since this, however, is conceived as an interaction between primarily split and separate processes, which interact only *secondarily*, it can only be considered an unsuccessful attempt to patch up what remains fundamentally a separatist theory of psychology. In maintaining the traditional separation of these psychological processes, one is faced not only with the difficulties of perception psychology alone, or of motivation psychology alone, but with the problems of one multiplied by the problems of the other. It is difficult to conceptualize the common ground upon which "perception" and "motivation" can meet and interact. So long as they are couched in different dimensions, the dualism which had postulated the pineal gland as the point

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